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BOTANICAL OFFICE LEAFLET

SERIES 3 NUMBER 1

ILLUSTRATED

Instructions on the Collection and Preservation of Plants for Private or School Herbaria

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By J. DAVIDSON, F.L.S., F.R.S.E.
Provincial Botanist



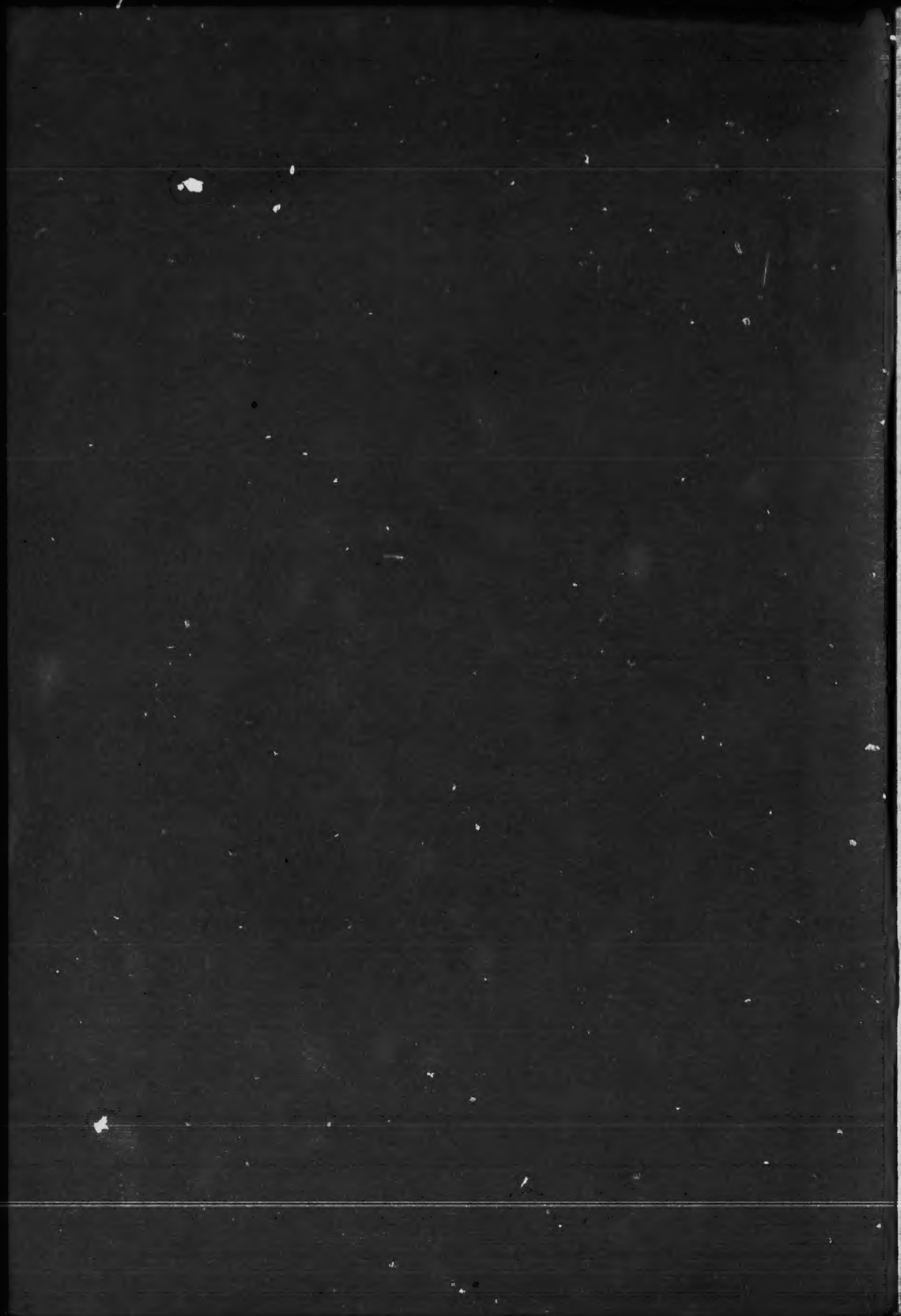
THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY

VICTORIA, B.C.

Printed by WILSON & CO., Printers to the King's Most Excellent Majesty,
1915.

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Frontispiece. The auriferous zone between 5,000 and 5,500 feet
on Black Tusk ~~shown~~ (See page 10.)

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Instructions on the Collection and Preservation of Plants for Private or School Herbaria.

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THE present leaflet is issued in response to numerous requests from correspondents in all parts of British Columbia for information as to how plants should be prepared to illustrate the flora of their district. These requests have been received from private individuals, from surveyors, and more recently from teachers, several of whom have begun to make collections for themselves or for the schools to which they are attached. In order to save continual repetition, it is considered that an illustrated leaflet covering the principal points of the desired information will serve the purpose better, and may also serve to stimulate others to take up this fascinating work.

(1.) AIMS IN MAKING A COLLECTION.

Before making a collection it is advisable to have some definite aim in view, so that all the specimens when prepared will illustrate the particular purpose for which the collection is made. No encouragement is given to those who have developed a mania for collecting simply for the love of accumulating specimens. Such mixed collections are of little value; with no definite object in view, the data accompanying the specimens is usually meagre and incomplete.

In order to help beginners to decide on some suitable subject to illustrate by means of a collection, I submit a few examples which will cover most of the cases which are from time to time submitted to the Botanica! Office for assistance.

(a.) *Ranchers* may find it of interest and value to have a named collection of all the wild plants found on their ranch before the ground was cultivated; others will find it useful to have named specimens of the various weeds found in their vicinity, so that they may become familiar with the well-known, as well as the rarer, pests which have to be contended with in their agricultural operations.

During a rancher's lifetime he is liable to see the appearance and disappearance of certain plants in the vicinity of his farm. Some of these casual specimens have been introduced, and it would be of interest to have such specimens from ranchers with suggestions as to their probable origin; sometimes strange plants are introduced in moss-litter, imported hay, and other farm supplies. We therefore solicit the co-operation of ranchers so that we may learn of all casually introduced plants.

(b.) *Surveyors* have abundant opportunities to form interesting and valuable collections from districts they have traversed. During his travels a surveyor comes across many interesting specimens; sometimes he is familiar with specimens which may be very rare, or even new to science; yet, with the exception of a comparatively small number of British Columbia land surveyors, most of them are content to pass by those specimens unheeded.

(c.) There are many *private individuals* situated in various parts of the Province who have taken up the formation of private herbaria as a hobby, and who have found their rambles in the woods, on the mountains, or along the sea-shore in search of specimens a source of health-giving recreation after six days' confinement in the office or store. As a rule, such individuals make collections of native plants, and do their best to ascertain the native flora of certain districts within easy access of their residence.

In the East one finds that in the above class of collectors many become enthusiastic botanists, becoming so interested in the plants of one family that they desire to have all the native species of that family represented in their collection. This will, no doubt, result in a considerable amount of exchange between collectors on the Coast and collectors in the Interior; both benefitting by the increased knowledge of the floral resources of the Province.

The Botanical Office will be glad to put correspondents into touch with each other for purposes of exchange.

(d.) *School-teachers* who have the interest of their profession at heart, particularly those having to teach botany and nature-study, and who are really enthusiastic in this work, will find many uses for a school herbarium.

It is equally necessary in the formation of a school herbarium to have some definite aim, or aims, in view. Its scope should be decided by the principal and teachers of each school, and the following may help in coming to a decision regarding the aim of the school herbarium:—

- (1.) Whether merely to represent the wild flowers in the district around the school:
- (2.) Whether it is intended to take up particular families of native plants, and obtain all the species of that family which are found in the Province:
- (3.) Whether it is intended to teach certain subjects of particular interest, and illustrate these by native specimens from any part of the Province:
- (4.) Whether it is intended the school herbarium should be sufficiently comprehensive to include the above three plans.

It is very desirable, in the formation of the herbarium, that teachers should co-operate with the principal, and also that the children in various classes should co-operate with the teachers, so that all may have a share in making the school collection as perfect as possible, gradually replacing the poorer specimens by better ones when they are available.

(2.) WHEN TO COLLECT.

Collecting should as far as possible be done during dry weather. Plants have then less moisture in their tissues, and are more disposed to give off even the little they contain.

Specimens collected during wet or dull weather—having their cells more or less gorged with moisture—take much longer to dry, and result in less successful preparations.

During expeditions it is often necessary to botanize in all kinds of weather, and specimens collected in wet weather should be spread out so as to get rid of as much of the superfluous moisture as possible. If wet when put into the presser they are liable to blacken through decay of cell contents, and are afterwards more liable to be attacked by mould, etc.

(3.) WHAT TO COLLECT.

It is desirable to collect as perfect specimens as possible of every plant intended to be pressed; root, stem, leaves, flowers, and fruits should as far as possible be shown, and when these have to be obtained at different seasons it is imperative that the greatest care should be taken to ensure that the fruits and flowers of the same plant—or at least of the same species—be placed on one sheet. Carelessness in this direction may lead to the collection being worse than useless.

Along with each specimen a certain amount of data should be collected. Specimens without data are of no value to a botanist. The locality, date, and name of collector should always be given.

(4.) SELECTION OF MATERIAL.

The herbarium preparations should show the various characteristics necessary for classifying the specimens. These are, or should be, based on the least-variable characters in each species.

In some plants the roots or the underground stems are of the utmost importance; in others these are of little importance in ascertaining the species. So with other characters each genus has certain structures which are considered of great importance, and if these structures are not shown on the specimen it may not be possible to fully classify it.

Mosses should always show the fruits (sporophytes) as well as the leafy branches.

Ferns should show fronds with and without spores on the under-surface, and these should not be too ripe.

Conifers should show twigs bearing leaves and cones attached.

Grasses should have their flowers well matured and show the nature of the root.

Sedges and Rushes should show both the flowering and fruiting conditions, including also the base of the stems and a portion of the root system.

Orchids should be in full flower, and where possible the tuber or root system shown.

Willows should show catkins and leaves from the *same tree*; it is not sufficient to say that the catkins are from one tree and the leaves from another "of the same species," because in British Columbia we have so many species which resemble each other in catkins and mode of branching, while differing in their leaves, that such a proceeding is unsafe.

Cruciferous Plants—those belonging to the Wallflower and Cabbage family—should show both flower and ripe fruits, because in most cases it is necessary to examine the seeds under the microscope. The basal leaves should also be shown.

Buttercups, and various other members of that family, should show matured fruits as well as flowers and basal leaves.

Leguminous Plants—those belonging to the Pea family—especially the genera *Lupinus* and *Astragalus*, should show both flowers and mature pods attached to the plant.

Rosaceous Plants—those belonging to the Rose, Raspberry, and Strawberry family—should also show the fruits when possible, or supply information on the colour of the so-called "berries" when ripe. It is a good plan also, when the plants have prickles—often erroneously referred to in books as spines—to cut off a piece of the bark from the stems to show whether the prickles are straight or curved, weak or strong, and whether they are accompanied by aciculi (delicate prickles) or not.

Umbelliferous Plants—those belonging to the Carrot and Parsnip family—should show flowers, mature fruits, and roots. In some species the roots are round and tuber-like; in others they are elongated and carrot-like. Some species closely resemble each other in the size and colour of the flowers, but differ markedly in their fruits.

The Compositæ—The Aster and Sunflower family—are usually classified by their flowers and seed-like fruits. Most of the genera in this family have their fruits furnished with a hairy float—the pappus, which is of considerable importance in classifying the various species.

It is advisable to add a note regarding the colour when fresh, because the colour of some flowers fades in drying.

There are other families and genera which might be added, but the above are amongst the most important. Correspondents will be advised of others as specimens are received.

(5.) HINTS ON FIELD-WORK.

EQUIPMENT.

The equipment consists of: (1) A case to protect the specimens until they are placed in the pressing-frames; (2) a botanical digger (or strong narrow trowel); (3) a pocket-lens, preferably one with two (or three) glasses; (4) a supply of slips of paper with two slits in each; (5) a pocket note-book; and (6) a few small envelopes for seeds or small specimens.

A few sheets of good blotting-paper bound together, like a book, between two strong covers and kept close by a strong elastic band, makes a very useful accessory for pressing specimens on the spot, particularly such flowers as are liable to drop their petals soon after the plant has been collected. Many other plants may be more successfully prepared in this way, especially those having delicate or deeply-cut leaves like the maidenhair fern, meadow-rue, and many of the Carrot family, etc. On reaching home or headquarters, the specimens should be removed from the temporary presser and placed between the proper frames.

The botanical case or *vasculum* (Fig. 1) has not yet been superseded as the best means of retaining the freshness of the specimens until ready to be pressed, and if the plants are laid carefully into the *vasculum* as they are collected it is surprising how many specimens can be brought home without crushing or damaging them.

In Fig. 1 a small compartment is shown at one end; this is useful to keep supplies of labels, envelopes, seeds, fruits, etc., which become moist if stored in the large compartment with plants.

In cases of emergency, when a *vasculum* is not available, a piece of water-proof sheeting may be used to wrap plants in order to retain the moisture, but they are more liable to be crushed.

Surveyors have sent in several successful collections prepared by simply placing the specimens between the pages of a monthly magazine which was carried in the coat-pocket, the data being usually written on the margin of the page.

The botanical digger should be made of good steel, and may be straight or curved as shown in Fig. 2, but it is advisable to see that the blade is continued into the handle. The strongest part of the digger should be at the junction of the handle and blade; otherwise one is liable to be left with the handle only, the blade remaining in the ground.

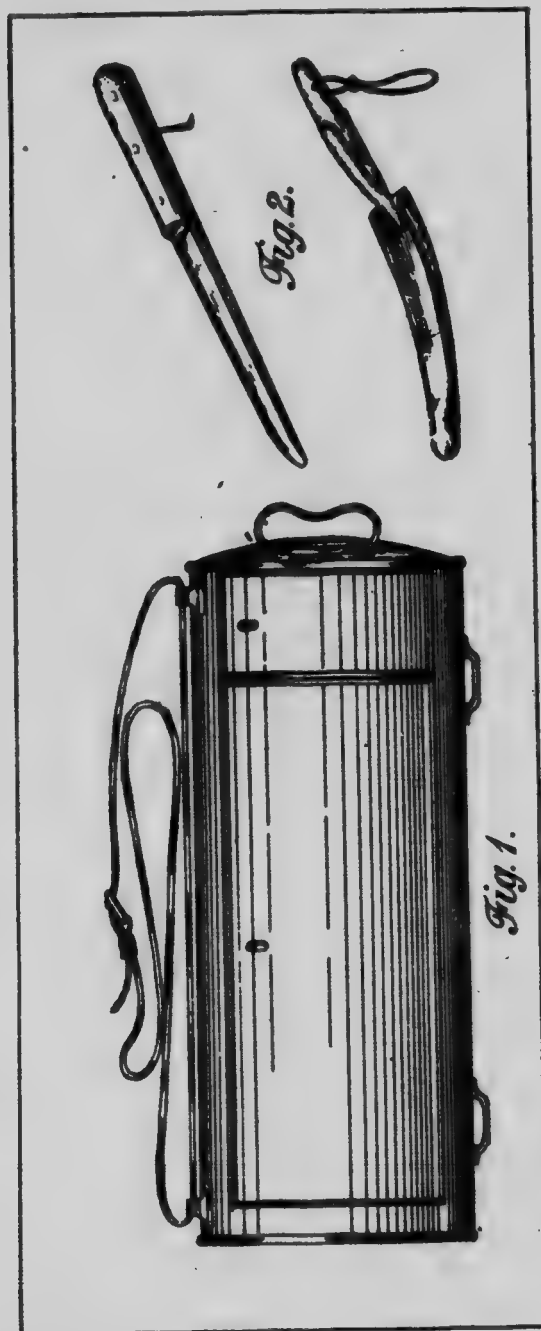
FIELD METHODS.

Nearly every one has noticed, in passing through the country from one locality to another, that the flora varies in different districts and even in different areas within those districts, according to the habitat, exposure, and soil conditions. We wish to encourage an intensive study of the plants in every region of the Province, and a few words on this work may prove helpful to beginners.

The flora of any area has a distinct relation to its environment; that is, to the nature of the soil, the rainfall, the temperature, exposure to wind and light, and to every other factor which in any way affects the growth and distribution of the plants in that area.

We find many instances of similar environments producing similar floras. It follows, therefore, that if we know the flora of a given area we know much regarding the conditions which constitute the plants' environment. Plants which are characteristic of some particular environment are said to belong to the same "plant association," and one of the aims of this Department is to ascertain all the plant associations in British Columbia; the information gained will be of future economic importance.

For those who wish to take part in this interesting work, the following instructions should be attended to as far as possible: Select an area of ground where the flora seems most distinctive; this area may be only a hundred yards in extent or it



may be several miles. State as accurately as possible its geographical position; give as much information as possible concerning the composition of the soil, the supply of water, the rainfall, the approximate duration of snow, the approximate length of summer, average and maximum temperature in summer, and average and minimum in winter; whether exposed to north and shaded from south, or vice versa; whether protected from north winds, or uniformly exposed to wind and sun. The prevailing winds at each season should be given, as this has often to do with the growth and distribution of plants.

It may not be possible for every correspondent to supply all the data desired, but an effort should be made to give as full details as possible, so that we may trace those plants which belong to that particular plant association and distinguish those plants which do not belong to it, but which have come in from an adjacent environment.

As an aid to selecting areas I submit the following examples:—

(1.) One of our correspondents visited an island—a few hundred yards in extent—on the Fraser River, and discovered that the flora differed from that of the surrounding country. He is now co-operating with this office to ascertain the origin of the flora, and the particular conditions which have led to the inhabitation of the island by plants which are not found on the adjacent banks of the river.

(2.) Very often in the vicinity of a lake one finds a zone—varying from a few feet to many yards in width—of characteristic vegetation which is more or less clearly distinguished from the vegetation outside this zone. It may even be found that different parts of the zone show variations according to exposure or some other factor which, after a little practice, can easily be ascertained. What are the characteristic plants of this zone; and what relation do you find between them and the place in which they grow? (*See frontispiece.*)

(3.) What difference do you find between the flora on the north slopes of a mountain and that on the south slopes; or of a valley running east and west, and one running north and south? and so on. Correspondents should have little difficulty in selecting a suitable area to work up.

For the intensive study of any such area it is necessary to collect every form of plant-life, beginning with the dominant plants which constitute the mass of vegetation, followed by the next dominant, and so on. Very often two or three species are present in almost equal numbers, so that one cannot be said to be dominant. The comparative abundance or frequency of all other species should be given.

In the vicinity of Victoria two striking plant associations may be seen on comparing the flora of an area on which oak constitutes the predominant vegetation with the flora of an area on which fir is dominant; or in the vicinity of Vancouver on areas where cedar (*Thuja*) is dominant compared with those on which fir (*Pseudotsuga*) is dominant. There are many other plant associations to be studied, sand-dunes, rocky coast, muskeg, etc., in many parts of British Columbia.

It is a good plan to get into a habit of using the note-book as much as possible in the field. As you collect each specimen attach to it a paper slip bearing a consecutive number corresponding to that in your note-book, and corresponding to the duplicate specimen sent to the Botanical Office. Information relating to particular specimens can then be given by referring to the number. (Fig. 3.)

In your book make field-notes on the height of the plant, habit, soil, frequency, and any other points of interest. By doing so one can compare plants of the same species from different areas and note the variations in height, habit, and other characters which show any relation or adaptation to environment.

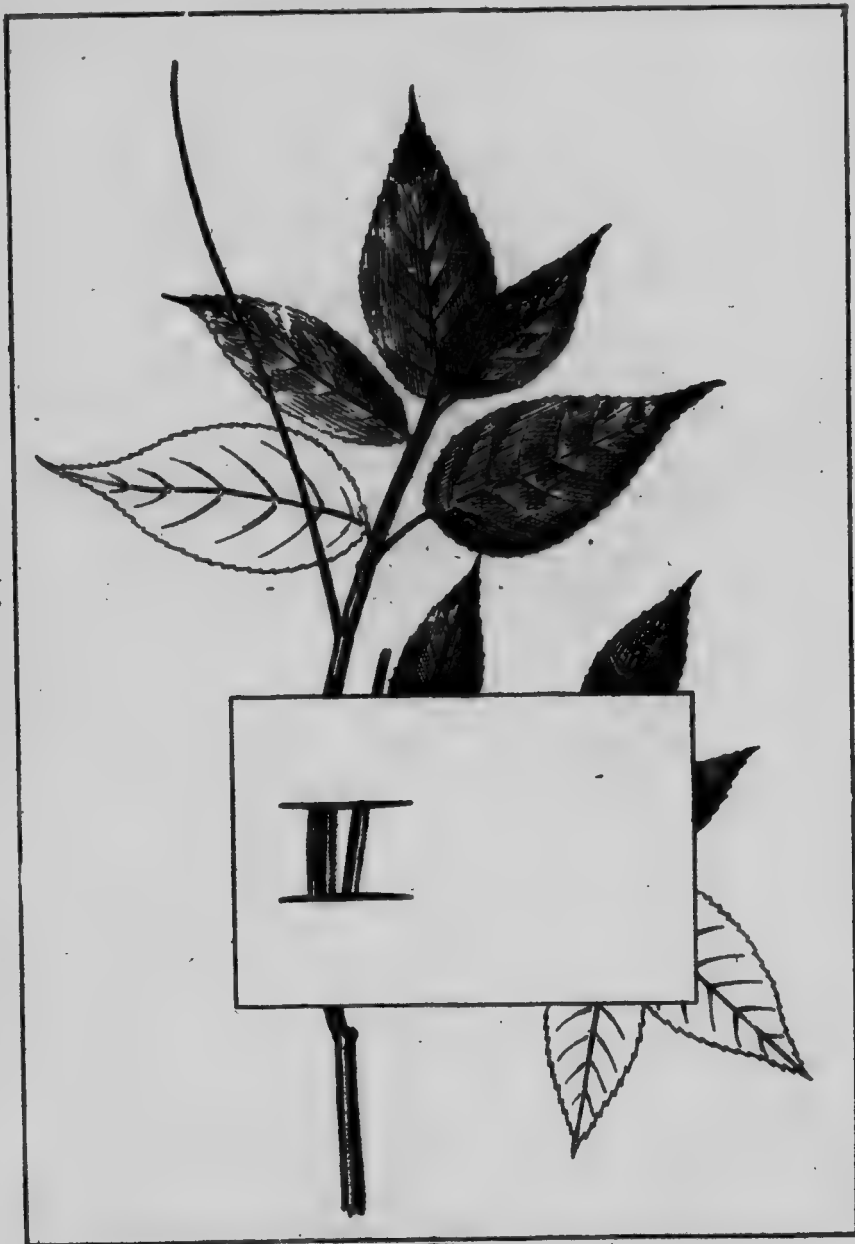


Fig. 3.

(6.) PREPARATION OF SPECIMENS.

PRESSING AND DRYING.

This is done by laying the specimens between sheets of absorbent paper, and subjecting them to sufficient pressure to prevent the shrivelling of the leaves and flowers while drying.

Two important points should be borne in mind: (1.) The faster the plants are dried after being gathered, the better will they retain their colour. Therefore every means should be used to allow free evaporation while under pressure. (2.) The faster plants are dried the more they tend to shrivel. Therefore the pressure should be sufficient to prevent shrivelling—no more.

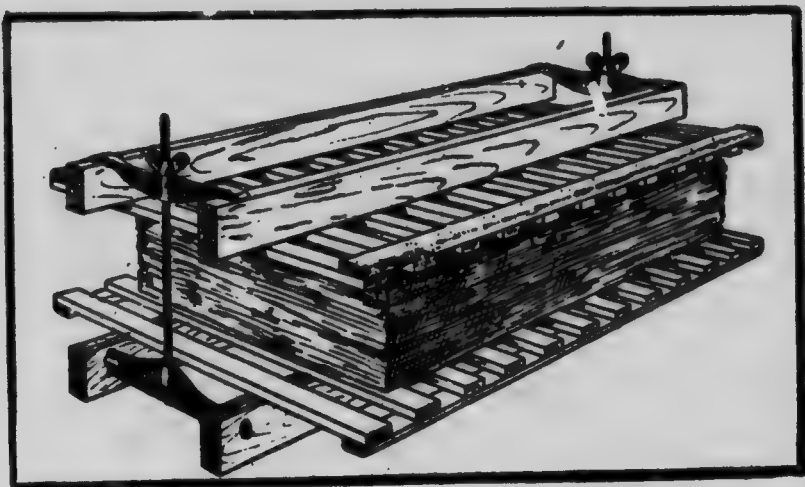


Fig. 4. Wooden plant-presser made in the United States; recommended by dealers for its simplicity and lightness; costs in the States \$2.50 complete.

If specimens are dried slowly they become discoloured; yellow, brown, or black. A few species invariably turn black, due to chemical changes in their tissues; some of these may be successfully prepared if dipped for about one minute in boiling water before pressing. This should also be done to succulent plants to kill them, otherwise they may continue to grow after being pressed, and even after they are mounted; some orchids and stonecrops are liable to do this.

Many methods are adopted to dry specimens rapidly. Successful preparations may be made by displaying the specimens on a layer of absorbent paper, with another layer on the top, then ironed with an electric iron. This can be recommended for the retention of autumnal tints of leaves, the various reds, greens, and yellows keeping almost the natural colours. Maidenhair and other ferns are also successfully prepared in this way. Sometimes cloth is used between the iron and the specimen, but this tends to leave a linen impression on the surface of the specimen.

The best method for most purposes is the one adopted in the Provincial Herbarium by the use of strong wire frames made for the purpose, and procurable in Vancouver at \$1 per pair. These and the method of tying them to secure the necessary pressure are illustrated in Fig. 5, and they are used as follows:—

Lay one of the frames on a table, the long thin-wire side uppermost, the thick cross-wires being towards the table. On this lay two or three sheets of absorbent felt paper, and on the uppermost sheet display your specimens as naturally as possible; cover this sheet with as many specimens as it can take, so as to ensure uniform pressure.

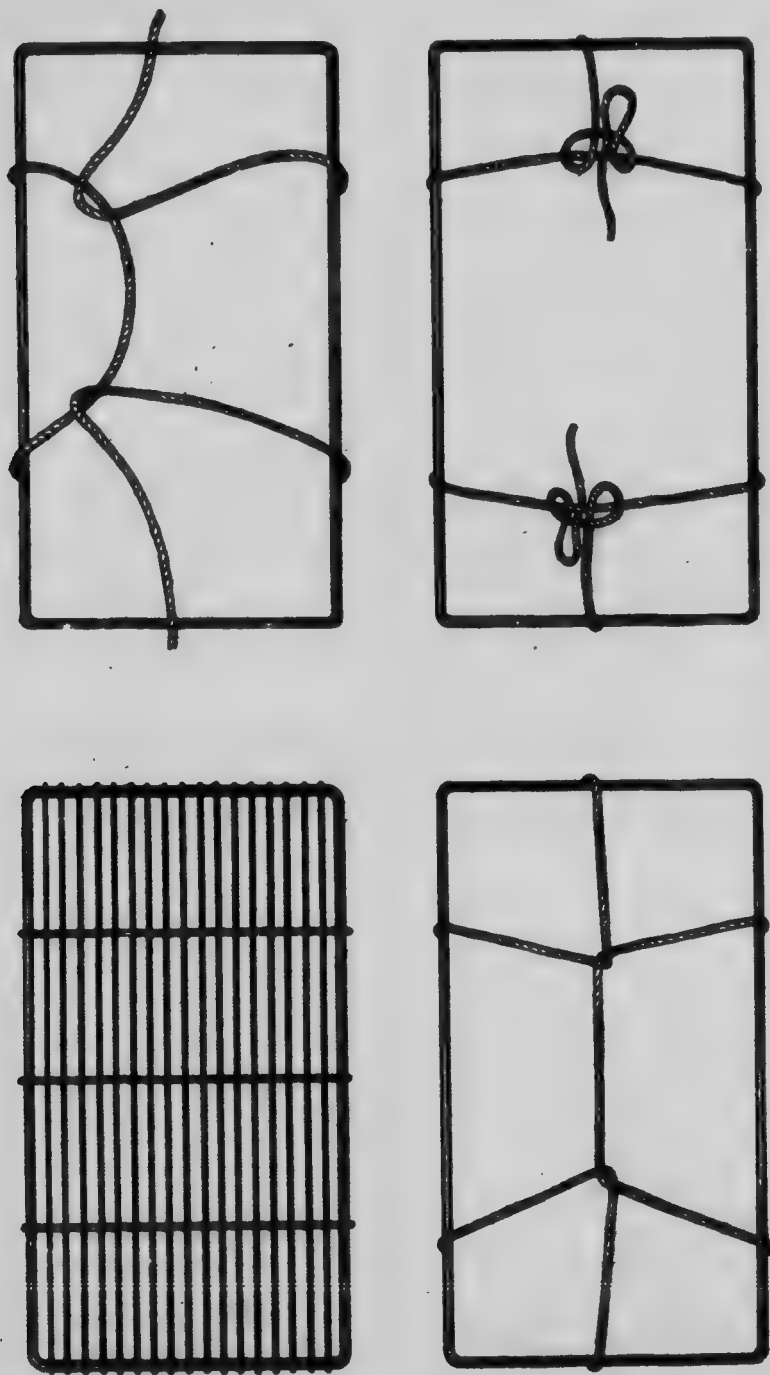


Fig. 5. Improved form of plant-presser used in Provincial Herbarium, weights $3\frac{1}{4}$ lb.; made in Vancouver, B.C.; costs \$1 complete.

On the top of this layer of plants place another sheet or two sheets of felt paper, and repeat the display of specimens and alternate layers of paper and specimens until the bundle reaches about 6 inches in height.

The last layer of plants should be covered with other two or three sheets of paper and the other wire frame laid on the top, with the thin-wire side towards the paper and the thick cross-wires uppermost.

The whole bundle is then tied by means of a soft rope as shown in the illustration. The rope is shown loose to make the illustration more clear, but in tying it should be pulled as tight as possible until the bundle is reduced to about half its original bulk.

If the specimens have been carefully arranged, the bundle may be hung up and exposed to sun and air, or placed by a stove or hot-water radiator to dry. Sun-dried specimens are most successful. (Fig. 6.)

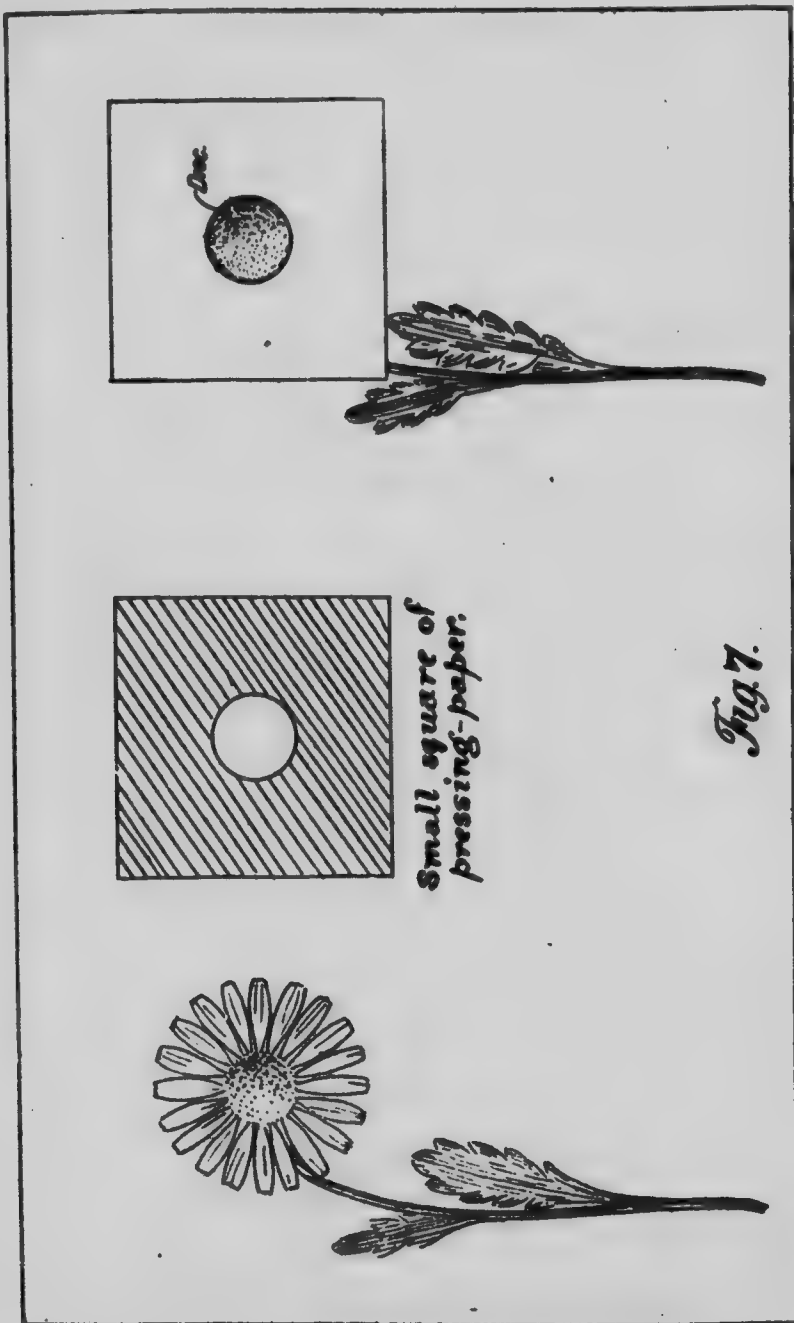


Fig. 6. Camp at Garibaldi. (Note plant-presser drying in the sun.)

As the plants lose moisture the ropes will require to be tightened; before doing this it is advisable to undo them and look over the specimens to see that all the parts are properly displayed; leaves are liable to accidentally overlap or double up. It may occasionally be necessary to remove damp sheets and replace by dry ones. As a rule, however, this is unnecessary, so that the work of plant-pressing is reduced to a minimum, and the monotony of repeatedly changing the papers is practically dispensed with.

Under ordinary conditions drying will be completed in from one to three days, according to the nature and number of specimens in the bundle. They should not, however, be removed from the presser until quite dry (this is usually ascertained by their becoming more or less brittle), otherwise beautiful specimens may shrivel and become useless. Every specimen in the press should be accompanied by its label bearing the necessary data or number.

It is often necessary to adopt special means to make specimens appear natural when pressed. For example, when the plant has a large number of leaves around the stem, some of those may be removed from the side which lies next to the paper. A thick stem may have the back portion removed; the specimen may be more firmly glued to the sheet if this is done. A tuber or thick root can be similarly treated and part of the fleshy tissue taken out.



Flowers—such as dogwood, or many of the Compositae (Sunflower family)—with a high or cushion-like centre should be pressed by the use of a number of pieces of drying-paper cut as shown in Fig. 7, sufficient to ensure equal pressure on the showy parts around the centre.

POISONING.

Many plants are liable to the attacks of insects which lay their eggs in the flowers or flower-heads. These eggs often hatch during or after the drying operations, and if laid past at once caterpillars may play havoc with the specimens, frequently eating their way through the herbarium sheets. The presence of small pellets like grains of gunpowder in the vicinity of the flowers indicate that the specimens need to be attended to at once.

In addition to this, specimens are liable to be attacked by mites (*Acar*), sometimes, but erroneously, referred to as small insects. These are most frequently found in the flowers and hollow stems of herbaceous plants, and on account of their feeding in the interior of the plant they may be at work long before they are discovered. If the minute creatures are not noticed running over the paper, their presence may be suspected when a fine powdery dust—often accompanied by the disintegration of flowers or the crumbling of stems—is observed on a herbarium sheet.

In order to avoid such attacks it is advisable, though not absolutely necessary, to poison the specimens after they have been pressed and dried. It should be mentioned that some specimens lose a little of their brilliant colouring after being poisoned; the majority, however, are unaltered if rapidly dried again.

No specimens are incorporated in the Provincial Herbarium until they have been poisoned. All specimens after being pressed and dried, and all pressed specimens received from correspondents, are poisoned at the first opportunity. It is therefore unnecessary for correspondents to poison specimens sent to the Botanical Office.

The following is the method adopted in this Department, and can be recommended as probably the best for all herbarium purposes:—

From 20 to 40 oz. of poisoning solution are poured into a large flat enamel or earthenware dish (the solution corrodes metal). The specimens are dipped one by one for a few seconds in this, then placed directly on the drying-paper and again returned to the pressing-frame to dry. After twenty-four hours the drying-paper should be quickly changed; the rapid evaporation of spirit from petals or thin leaves tends to make them curl up.

During the poisoning operation it is necessary to see that every part of the specimen is submerged in the solution; specimens with large flower-heads should remain long enough to become permeated, so that any eggs, caterpillars, or mites may be destroyed.

To prepare the solution: Dissolve 1 oz. corrosive sublimate (powder or crystals) in 3 pints of methylated spirit, and add 1½ oz. strong carbolic acid. Keep corked to prevent evaporation of spirit. (NOTE.—As this solution is dangerously poison it should be labelled so, and kept out of the reach of children.)

The specimens may be moved in the fluid by means of thin pieces of wood. The skin and finger-nails become hardened by frequent handling of specimens while in the solution; this may be obviated by the use of rubber gloves or finger-stalls.

When a bundle of specimens has been poisoned, the remaining solution may be poured back for future use.

If traces of a white deposit are found on the specimens after they have been poisoned and dried, this indicates that the solution has become too strong through the evaporation of spirit; add sufficient spirit to ensure that no deposit is left.

Specimens thus prepared are practically proof against moths, mites, and mould, and are ready to be mounted as permanent preparations.

MOUNTING

Specimens may be mounted as either temporary or permanent preparations. Only poisoned specimens should be permanently mounted, and all permanent mounts should be done on sheets of standard size, so that, if necessary, exchanges may be made with other collectors in the Province or with botanical institutions abroad.

The size used in the principal and largest herbaria in the world is approximately 10½ x 10½ inches, which is the standard size in the Provincial Herbarium.

In mounting specimens the aim should be to display the plants as naturally as possible without attracting attention to the method by which they are fixed to the sheet. Permanent preparations should be glued, but no traces of glue should be visible.

Temporary preparations are usually fixed by narrow strips of transparent gummed paper such as is used in repairing books, etc.; some collectors sew them to the sheets with needle and thread, but this is not recommended.

No unpoisoned specimens should be glued with gum; they may be fastened by strips of transparent gummed paper. Poisoned specimens when mounted on paper other than standard size should be similar to standard size sheets later on. Specimens glued to sheets of less than standard size lose much of their value as herbarium preparations.

The glue used is liquid fish-glue; this must be applied by a brush to the underside of the plant. All parts of the plant which come in contact with the paper should be coated. The plant is then transferred to the mounting-sheet and laid under gentle pressure to keep the specimens in contact with the sheet until the glue dries.

When many specimens are to be mounted (sometimes the season's collection is laid out and mounted during the winter months) it is a good plan to get a sheet of glass of the size of the mounting-paper; smear this with a film of dilute glue; the specimens are laid one by one on the glass, the various parts being pressed—by the finger—into contact with the glue, then lifted off and transferred to the mounting-paper. In this way a hundred or more specimens may be mounted in one evening.

In mounting slender, delicately branched specimens the ordinary method generally results in mashing the parts with glue. To avoid this, take a sheet of blotting-paper of the same size as the mounting-paper, arrange the specimens—lower side up—on this, and paint all parts with glue. Then lightly dab with water so that if any gets on the blotting-paper it will be readily absorbed. The sheet of mounting-paper is now laid over the glued specimens and pressed into contact by passing the hand over it. Both sheets—blotting-paper and mounting-paper with the specimens between—are lifted up and with a little pressure turned over so that the mounting-paper is lowermost; when the blotting-paper is removed the specimens will be found beautifully mounted, showing no discernible traces of glue.

In mounting stiff or woody specimens it is often found that the ends of the stems tend to leave the paper. It is a good plan, in such cases, to make a slit on the mounting-sheet immediately under the twig; a strip of strong paper is placed round the twig, through the slit, and glued at the back of the sheet. This saves disfiguring the sheets by showing strips of paper glued to it.

(7.) CLASSIFYING AND LABELLING THE SPECIMENS.

It is usual to classify herbarium specimens according to their natural order. All the species of each genus are placed in what is called a genus cover, which encloses the mounted specimens like the covers of a book. Genus covers are made of strong paper of any colour—brown, green, cream, or grey—and the name of the genus is placed on the left bottom corner. If there are too many sheets for one genus cover, certain species are placed together in one cover, and the rest in other covers similarly labelled on the corner.

All the genera of each family are kept together, and the families arranged in a consecutive order according to some recognized system of classification. They should not be arranged alphabetically. Gray's Manual of Botany (seventh edition) gives most of our British Columbia plant families in natural sequence, although for the determination of our native species it is of very little value.

The best "Floras" for British Columbia plants are Howell's "Flora of Oregon" (now out of print); Piper's "Flora of Washington"; and Clements and Clements' "Rocky Mountain Flowers." Neither of these deal with all our species, and all include species not found here.

It is necessary to have a small library of "Floras" and other publications in order to determine the species of all our British Columbia plants. Many mistakes are made by amateurs in classifying specimens by the aid of inadequate "Floras."

The Botanical Office has arranged to render as much assistance as possible in the identification of plants for correspondents, the only condition being that good duplicates are sent, accompanied by the locality, date, and collector's name.

Duplicates should bear the same number as the specimens retained by the sender, and later collections should be consecutively numbered; that is, the numbers on the second collection should begin where the first collection ended, and so on. Duplicates received for identification are retained for the Provincial Herbarium. In special instances where the collector cannot supply a duplicate on account of the rarity of a specimen, arrangements may be made to return the original if desired.

If the collector is situated within a day's journey of Vancouver, it is desirable to have the specimens sent as fresh as possible, so that they will reach the Botanical Office within two days from the time they are collected; otherwise they are liable to suffer, especially during hot weather. The specimens should be carefully laid together, each with its number on a label attached as shown in Fig. 3. They may then be wrapped in a sheet of oiled or paraffined paper—such as is used by florists—and the whole wrapped firmly in strong paper, the address and stamps being placed on a label-tag (addressed label-tags for this purpose are supplied by the Botanical Office). If the stamps are placed on the wrapping-paper, the package is liable to get damaged by post-office officials when cancelling the stamps.

When specimens are likely to arrive at the Botanical Office three or four days after being collected, it is advisable to lay them between sheets of old newspaper and send them flat. Many correspondents, however, press two or more specimens of each species and send collections of duplicate herbarium specimens at intervals during the summer, and some send the whole set at the end of the season.

On receipt of the specimens—whether fresh, or dried as herbarium specimens—a list of the numbers and the names of the specimens bearing those numbers is sent to the correspondent, who can then name his or her specimens by comparing the numbers on the list with the numbers on the specimens retained. The correspondent will then be able to refer to his plants by their proper name.

In labelling the specimens the following should be indicated in the order given: Family, botanical name, English or local name, locality, collector's name, date. Labels should always be placed at the right bottom corner of the sheet.

SPECIAL SETS FOR NATURE-STUDY OR BOTANY LESSONS.

In school herbaria it is often desirable to have sets of specimens to illustrate particular studies of plant-life. These should be made up from duplicates in the collection illustrating the local flora, plus other native or introduced species.

For example, sets may be prepared to illustrate lessons on "climbing plants," "methods of protection," "pollination," "leaves" (including form, margin, apex, pubescence, etc.), and other subjects.

It is occasionally desirable to illustrate certain features by the use of introduced species, and by including them in special illustrative sets it saves mixing exotic species in the collection of native plants.

It is intended to issue from this office a series of leaflets on selected studies which may be illustrated by the preparation of special sets, referring as far as possible to British Columbia herbs, shrubs, or trees.

(6.) STORING THE SPECIMENS.

The principal point to attend to in storing specimens is to keep them as nearly as possible dust-proof. It is disappointing to find beautifully prepared and mounted specimens on sheets with the corners or edges soiled with dust. All sorts of so-called dust-proof cases have been devised and are sold for this purpose. Boxes of cardboard, wood, and tin may be obtained from various dealers, and in some instances these serve their purpose if the specimens are not much used; but when it is desired to have them readily accessible, so that specimens can be got without much loss of



Fig. 8. Showing the structure of the British Columbia herbarium cases at present in use.

time and without unduly disturbing other specimens, some form of herbarium case is necessary. Drawers are of practically no use, and sets of shelves with glass or wooden doors are equally useless, because the opening and closing of the drawers or doors causes a suction which draws in dust that has settled in the seams.

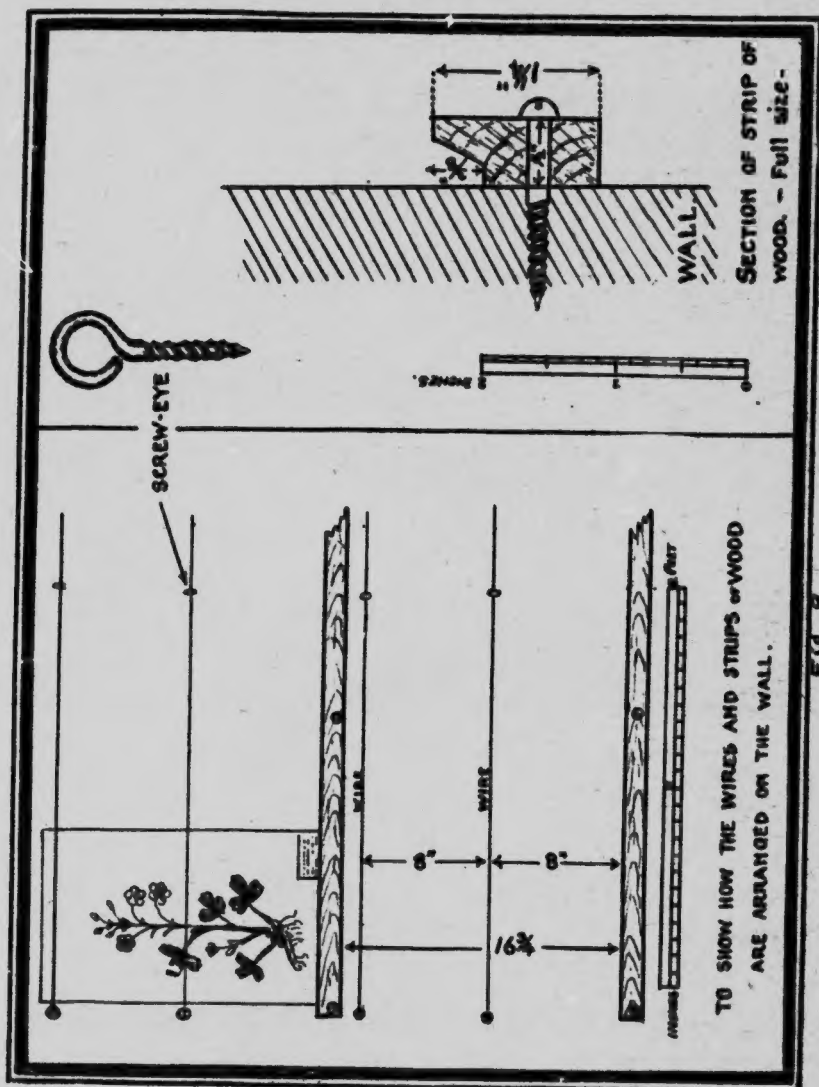
The method at present in use in storing the Provincial Herbarium is the result of twenty years' experience with different kinds of herbarium cases, and can be recommended for their efficiency, economy, and, above all, for their simplicity. They may be made by the boys in the manual-training classes; indeed, there is no reason why any one with two or three ordinary joiner's tools should not be able to make them.

They are shown in Fig. 8, and each consists of two pieces of wood 1 inch thick by 1 foot 7 $\frac{1}{4}$ inches wide by 5 feet 5 $\frac{1}{4}$ inches high, forming the sides; thirteen pieces of wood $\frac{3}{4}$ inch thick by 1 foot 7 inches wide by 13 inches long, forming twelve shelves and the top of the case.

The space between the shelves is closed in front by a piece of wood $\frac{1}{4}$ inch thick by $4\frac{1}{4}$ inches wide by 18 inches long, attached by two small hinges to the lower edge of the shelves; this hanging door should fit closely.

The herbarium drawer, like a tray with high sides and back, but open at the front, fits the inside of the space and has a simply bent strip of brass attached which acts as a handle and catch to keep the door tightly closed. A little naphthaline powder may be sprinkled in each compartment. Further details will be supplied on applying to the Botanical Office, Vancouver.

These drawers may also be used for storing genus covers, mounting and pressing paper, and the glass sheet used for mounting specimens.



(9.) DISPLAY FOR EXHIBITION.

Many schemes have been devised for displaying herbarium specimens for exhibition purposes. Some devices run up to a cost of several hundred dollars and occupy considerable floor-space.

Whatever scheme is adopted it is desirable that the herbarium sheets should in nowise suffer by it. Fastening the sheet to a wall by means of drawing-pins is strongly deprecated, not only on account of damaging the corners of the sheets, but also on account of the unsightly appearance presented by woodwork riddled with pin-holes.

FOR SCHOOL DEMONSTRATION PURPOSES.

One of the cheapest and most useful methods is to have narrow strips of wood permanently screwed to the wall along one or more sides of the room, preferably along the shaded sides, so that specimens will not be exposed to the full blaze of the sun's rays.

The strips should have the upper edge bevelled off towards the wall to form a groove to rest the sheets in. (See Fig. 9.) The lowest strip should be 3 feet from the floor. Eight inches above this a thin flexible steel wire (such as is used for hanging pictures) should be stretched tight the whole length of the strip, and supported here and there by passing through screw-eyes on the wall; another wire should be similarly fixed 8 inches above the first. These should stand approximately $\frac{1}{2}$ inch out from the wall to allow the specimens to be easily placed behind them. A second strip may be fixed 16 $\frac{1}{4}$ inches above the first; two more stretches of wire completes the equipment for two rows of specimens.

These might be placed on the walls of every class-room as part of the equipment, being equally useful for the exhibition of drawings or painting exercises done by the pupils.

The advantage of this method is: (1.) They occupy no extra space, and in nowise interfere with the use of the room or wall for other purposes. (2.) Their cost is trifling. (3.) Neither herbarium sheets nor walls are damaged by frequent exhibitions. (4.) The simplicity of placing the specimens behind the wires ensures that the trouble of fixing specimens up does not hinder frequent exhibitions.

FOR SPECIAL EXHIBITIONS.

For special exhibitions, such as the illustration of public lectures, the writer suspends each sheet by two paper-clips, which hook over strong cords or wires, stretched tight and supported at frequent intervals by pins. This necessarily takes more time and trouble and is not recommended for school exhibitions.

CONCLUSION.

Many minor details under the various headings have been omitted for the sake of brevity, and it is hoped that their omission has not detracted from the clearness of the instructions to beginners. If, however, any ambiguity exists and further details are desired, these will be gladly given on receipt of an inquiry addressed to the Provincial Government Botanical Office, Vancouver, B.C.

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